SKAKUN, N.A.; STRASHINSKIY, A.G.

Interlocking gas targets. Prib. i tekh. eksp. 6 no.1:180 Ja-F '61. (MIRA 14:9)

1. Fiziko-tekhnicheskiy institut AN USSR.
(Cloud chamber)

S/056/63/044/002/013/065
B102/B186

AUTHORS: Val'ter, A. K., Shakun, N. A., Klyucharev, A. I., Strashinskiy, A. G.

TITLE: Polarization of the protons in the $He^3(d,p)He^4$ reaction

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 44, no. 2, 1963, 475-477

TEXT: A cylinder 30 mm in length filled with He^3 gas was bombarded by deuterons of [illegible] kev obtained from an electrostatic accelerator. The proton polarization was measured with a helium polarimeter. In order to eliminate systematic errors, the analyzer was rotated through an angle of 180° during the measurements. At the well-known resonance E_d = [illegible] kev (excitation of the Li^5 $3/2^+$ level) the protons emitted are unpolarized, and this resonance can be used to determine the corrections for the analyzer geometry. The polarizations were calculated from the left-right asymmetry $R = (1+P_1P_a)/(1-P_1P_a)$; P_1 is the proton polarization, taken as positive in the direction of the normal of the scattering plane, and P_a

Card 1/2

S/056/63/044/002/013/065
B102/B186

Polarization of the protons ...

[illegible] from the polarimeter geometry and the p-He^4 elastic [illegible]. There are 1 figure and 1 table.

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk USSR (Physicotechnical Institute of the Academy of Sciences UkrSSR)

SUBMITTED: [illegible] 1962

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible] ± [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible] ± [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5,[illegible] ± 3,[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	7,[illegible] ± 3,6
[illegible]	[illegible]	[illegible]	[illegible]	5,8 ± 3,5
[illegible]	[illegible]	[illegible]	[illegible]	4,1 ± 3,4

Card 4/4

SKAKUN, N.A.; STRASHINSKIY, A.G.; KLYUCHAREV, A.P.

Measuring the polarization of protons elastically scattered by D^2, T^3, and He^3 nuclei. Zhur. eksper. i teor. fiz. 46 no.1:167-170 Ja'64. (MIRA 17:2)

1. Fiziko-tekhnicheskiy institut AN UkrSSR.

[illegible]; STRASHINSKIY, A. G.; KLYUCHAREV, A. P.

"Measurements of Polarization of Protons Scattered from Nuclei of D, T, and He^3."

report submitted for All-Union Conf on Nuclear Spectroscopy, Tbilisi, 14-22 Feb 64.

KhFTI (Ukrainian Physico Technical Inst, Kharkov)

ACCESSION NR: AP4012540 S/0056/64/046/001/0167/0170

AUTHORS: Skakun, N. A.; Strashinskiy, A. G.; Klyucharev, A. P.

TITLE: Measurement of the polarization of protons elastically scattered by D-2, T-3, and He-3 nuclei

SOURCE: Zhurnal eksper. i teoret. fiz., v. 46, no. 1, 1964, 167-170

TOPIC TAGS: proton scattering, proton elastic scattering, scattered proton polarization, scattering by deuterium, scattering by tritium, scattering by helium-3, few nucleon system, proton double scattering

ABSTRACT: Owing to the great lack of experimental data on systems with few nucleons, and in view of the very crude assumptions used in the calculations, measurements were made of the polarization of protons scattered by He^3 in the energy interval from 2.7 to 4 MeV at 40° (c.m.s.). Noticeable polarization appears at energies above 3.5 MeV, reaching a maximum P = 30 ± 5% at E = 3.37 MeV, and then

Card 1/2

ACCESSION NR: AP4012540

decreasing. Measurements have shown that there is practically no polarization of protons scattered by tritium at a c.m.s. angle of 40° and at 3.0 MeV. At 3.48 MeV the polarization amounts to (22 ± ± 11)%. Protons scattered by deuterium at 3.1 and 3.3 MeV exhibit negligible polarization. He^4 was used for the analysis of the polarization, and the doubly scattered protons were registered with photographic plates.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN UkrSSR (Physicotechnical Institute, AN UkrSSR)

SUBMITTED:	21Aug63	DATE ACQ:	26Feb64	ENCL:	00
DATE ACQ:	26Feb64	NO REF SOV:	003	OTHER:	003

Card 2/2

STRASHINSKIY, ~~B.A.;~~ KISHINSKIY, M.I., redaktor; SHMEL'KINA, S.I., tekhnicheskiy redaktor

[Organizing the construction of logging roads] Organizatsiia stroitel'stva lesovoznykh dorog. Moskva, Goslesbumizdat, 1952. 113 p. (Biblioteka lesozagotovitelia, no.42) [Microfilm] (MLRA 10:1)
(Forest roads)

1. STRASHINSKIY, F. A., Eng.

2. USSR (600)

4. Lumbering

7. Fast methods for building roads for transporting logs. Mekh. trud. rab. 7 no. 3 1953

9. Monthly List of Russian Accessions, Library of Congress, June 1953. Unclassified.

SOV/118-59-4-13/25

28(1)

AUTHOR: Strashinskiy, B.A., Engineer

TITLE: A Narrow-Gage Railway-Construction Machine

PERIODICAL: Mekhanizatsiya i avtomatizatsiya proizvodstva, 1959, Nr 4, pp 37-38 (USSR)

ABSTRACT: The loading of earth for railway beds of narrow-gage (750 mm) lumber transportation tracks is usually carried out by bulldozers on scaffold bridges. For transporting and unloading earth, the TsNIIME has developed removable flatcar-mounted dumpers, which increase labor productivity by 20 times as compared with the unloading of flatcars by hand. In 1958, the TsNIIME developed and tested an experimental machine for track raising operations of narrow-gage lumber transportation tracks. The machine is coupled with a narrow-gage locomotive (tractive force - over 2,000 kg) and is equipped with 2 attachments: 1) a device for the cross-shifting and levelling of earth and ballast from the track shoulders; 2) a

Card 1/2

SKRIPOV, Nikolay Ivanovich; STRASHINSKIY, B.A., red.; KALININA, L.M.,
red.izd-va; KARLOVA, G.L., tekhn. red.

[Precast reinforced concrete pavement on logging roads]Sbornoe zhelezobetonnoe pokrytie na lesovoznykh dorogakh. Moskva, Goslesbumizdat, 1962. 132 p. (MIRA 16:2)
(Pavements, Concrete) (Forest roads)

[illegible], Mikhail Il'ich, kand. tekhn. nauk, dots.; [illegible], Boris Yefimovich, kand. tekhn. nauk, dots.; [illegible], Pavel Stepanovich, inzh.; STRASHINSKIY, B.A., inzh., retsenzent; NOVIKOV, G.G., prepodavatel', retsenzent; GAVRILOV, I.I., red.

[Use and repair of logging roads] Ekspluatatsiia i remont lesovoznykh dorog. Izd.2., perer. Moskva, Izd-vo "Lesnaia promyshlennost'," 1964. 40 p. (MIRA 17:7)

1. Alatyrskiy lesotekhnicheskiy tekhnikum (for Novikov).

[illegible]SKIY, [illegible] [illegible], [illegible], inzh., [illegible]
[illegible], inzh., [illegible]

(Management of [illegible]) [illegible], [illegible]. 33 p. (MIRA 17:10)
[illegible]. Moskva, [illegible]

SAVYUK, V.G., inzh.; STRASHINSKIY, I.D., inzh.

New suspended reciprocating feeders. Gor.zhur. no.8:54-55 Ag '62. (MIRA 15:8)

1. Permskiy zavod gornoshakhtnogo mashinostroyeniya.
(Mining machinery)

KUZNETSOV, I.V., red.; Prinimali uchastiye: BLYAKHER, L.Ya., prof., red. ; STRASHUN, I.D., prorf., red.; SHVARTSMAN, A.L., red.; BALASHEV, L.L., prof., red.; SKATKIN, P.N., kand. biol. nauk, red.; MIKULINSKIY, S.R., kand. biol. nauk, red.; KUZNETSOVA-YERMOLOVA, Ye.B., red.; KRYUCHKOVA, V.N., tekhn. red.

[People of Russian science; sketches of outstanding figures in the natural sciences and technology: Biology, medicine, agricultural sciences] Liudi russkoi nauki; ocherki o vydaiushchikhsia deiateliakh estestvoznaniia i tekhniki: Biologiia, meditsina, sel'skokhoziaistvennye nauki. Moskva, Fizmatgiz, 1963. 895 p. (MIRA 17:1)

1. Deystvitel'nyy chlen AMN SSSR (for Strashun).

SPRA[illegible], [illegible], inzhener.

Once again about single-thread fillings. Leg. prom. 17 no.7:34-35 Jl '5[illegible]. (MIRA [illegible]:9)

(Knit goods industry)

[illegible]

[illegible]

[illegible]

MOROZOV, Stanislav Ivanovich; SAVIN, Leonid Yerofeyevich; STRASHINSKIY, V.A., red.; MYAKUSHKO, V.P., red. izd-va; SHIBKOVA, K.Ye., tekhn. red.

[New types of pavements for forest roads]Novye tipy pokrytii avtomobil'nykh dorog v lesu. Moskva, Goslesbumizdat, 1962. 76 p.
(MIRA 16:1)

(Forest roads) (Pavements)

STRASHKEVICH, A. M.

"Electrical Electron Cylinder Lens," Zhur. Fiz., 3, No.6, 1940

Physics Inst., Ukr. Acad. Sci.

Jan 49

USSR/Physics
Fields, Electromagnetic

"Potential Field of Duants (Poles), I," A. M. Strashkevich, Chernovitsy State U, 2 pp

"Zhur Tekh Fiz" Vol XIX, No 1

Concerned with determining the distribution of a field in a space between duants (poles) which are located to yield the maximum focusing action of the field by the method of conformal representation.

24/49T110

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537.533.72

7006. The trajectories of charged particles slightly deviated from their initial direction by an electrostatic field. B. M. Rabin and A. M. Strashkevich. J. Tech. Phys., USSR, 20, 1232-40 (Oct., 1950) In Russian.

The time-independent differential equations of such trajectories are set up and are shown to lead to the known results when applied to a lens with rotational symmetry or a cylindrical lens. Applied to a trans-gradient system, they reduce to a form which may be solved by quadrature. A numerical example is worked and compared, inter alia, with the formulae of Hutter (Abstr. 3353 (1947)). J. C. R. Jennings

METALLURGICAL LITERATURE CLASSIFICATION

STRASHKEVICH, A. M.

Gabrilink, V. M. and Strashkevich, A. M. The potential field of the duants. II. Page 1241.

Chernovtsy State Uni.
Jan. 26, 1949.

SO: Journal of Technical Physics, Vol. 20, No. 10. October 1950.

STRASHKEVICH, A. M.

PA 195T68

USSR/Physics - Corpuscular Rays Jul/Aug 51

"Aberrations of Corpuscular Bunches of Arbitrary Shape in an Arbitrary Electrostatic Field," A. M. Strashkevich, I. M. Pilat, Chernovits State U

"Iz Ak Nauk SSSR, Ser Fiz" Vol XV, No 4, pp 448-466

General theory is presented in work by G. A. Grinberg (cf. "Zhur Tekh Fiz" 13, 1943; "Selected Problems of Mathematical Theory of Electric and Magnetic Phenomena" 1948. Authors derive trajectories of wide bunches in arbitrary electrostatic field and obtain expressions of total aberration in discussed

195T68

USSR/Physics - Corpuscular Rays (Contd) Jul/Aug 51

case. Investigate aberrations in fields of cylindrical lenses and aberrations of 2d and 3d order in plane fields.

195T68

PROCESSES AND PROPERTIES INDEX

SA

A 53
Q

537 533 72

9510. Electron-optical properties of electrostatic systems with apertures deviating from an ideal shape. B. M. Rabin, A. M. Strashkevich and L. S. Kirs. J. Tech. Phys., USSR, 21, 438-44 (April, 1951) In Russian.

The apertures are elliptical and the potential field is found by an extension of the method of Strashkevich, J. Tech. Phys., USSR, 10, 91 (1940), for various electrode arrangements. Two examples are tabulated and compared with measurements in an electrolytic tank. A series development valid near the axis is also obtained and the differential equations of the ray are set up. In the usual way, an integral expression is obtained for the longitudinal axial astigmatism, when the lens is thin and weak.

J. C. F. [illegible]

METALLURGICAL LITERATURE CLASSIFICATION

PA 193T95

STRASHKEVICH, A. M.

Oct 51

USSR/Physics - Electron Microscope

"Some Aberrations of Doubly Symmetrical Systems," I. M. Pilat, E. Ya. Koznik, A. M. Strashkevich

"Zhur Tekh Fiz" Vol XXI, No 10, pp 1149-1152

Authors study electro-optical properties of electrostatic systems in order to reduce aberration in electron microscopes. Refer to their previous work (cf. "Iz Ak Nauk SSSR, Ser Fiz" Vol XV, No 4, 1951). Submitted 23 Apr 51

PA 193T95

STRASHKEVYCH, O M.

STRASHKEVYCH, O.M.; LASHKAR'OV, V.Ye., diysnyy chlen.

Problem of relativistic electron optics. Dop.AN URSR no.5:393-396 '52.
(MLRA 6:10)

1. Akademiya nauk Ukrayins'koyi RSR (for Lashkar'ov). 2. Chernivets'kyy dershuniversytet (for Strashkevych).
(Electron optics)

[illegible], [illegible]

Electron Optics

Electron optical properties of double-symmetrical electrostatic fields. Zhur. tekh. fiz., 22, No. 3, 1952.

9. Monthly List of Russian Accessions, Library of Congress, August, 1952. Uncl.

STRASHKEVICH A. M.

IA 236T103

USSR/Physics - Electron Optics   Nov 52

"Principal Relations of the Relativistic Electron Optics of Nonaxisymmetrical Electrostatic Fields," A. M. Strashkevich

"Zhur Tekh Fiz" Vol 22, No 11, pp 1848-1856

States that, in practical electron optics, not enough interest has been shown in the fact of relativitic effect, especially in the case of nonaxisymmetrical fields. Sets up subject

236T103

relativistic equations, starting with the general equations of motion of a charge e in field E. Finally derives the focal distance f for relativistic case.

236T103

Strashkevich, A. M.

USSR

62

3729

GRAPH-ANALYTICAL METHODS OF FINDING THE TRAJECTORIES OF RELATIVISTIC CHARGED PARTICLES IN ELECTROSTATIC FIELDS. A. M. Strashkevich. Zhur. Tekh. Fiz. 23, No. 10, 1796-1801(1953). (In Russian)

Three methods are discussed and a table is given of the results obtained when they were applied to the case of a uniform field. Exact results are also given for comparison. (Science Abstr.)

STRASHKEVICH, A. M.

FD-601

USSR/Physics - Electron optics

Card 1/1 : Pub 153-13/22

Author : Strashkevich, A. M.

Title : Manifold-symmetric and manifold-antisymmetric electron optical systems

Periodical : Zhur. tekh. fiz., 24, 274-286, Feb 1954

Abstract : An accurate potential distribution was found for some systems with fields having asymmetry or antisymmetry. The electron optical effect in the operating region (near the axis) of the corrector for non-relativistic and relativistic electrons was found. The possibility is discussed of studying corrector fields and their electron optical effect by means of models 11 references, including 5 foreign.

Institution :

Submitted : May 15, 1952

STRASHKEVICH, A.M.

3/6

537.533.3

8231 EXTENSION OF THE ELECTRON-OPTICAL THEORY OF DEFLECTING ELECTROSTATIC SYSTEMS TO THE CASE OF RELATIVISTIC PARTICLES. A.M. Strashkevich.

STRASHKEVICH, A.M.

/**Straškevič, A. M.**, and **Gluzman, N. G.** **Aberrations of relativistic electron beams.** Z. Tehn. Fiz. 24, 2271–2284 (1954). (Russian) 62 1 - F/W

An electron beam is defined as the totality of moving electrons having the same initial velocity and trajectories close to an axial trajectory. Relativistic equations of motion are derived for a wide beam in an arbitrary electrostatic field. In this treatment the axis need not be a straight line but may be bent, e.g. in the form of a helix. The systems with a bent axis are of special interest since they may give rise to negative chromatic aberration. The special cases considered are the relativistic equations of motion in an axially symmetrical field, a flat field, the field of a cylindrical lens, and the field of a cylindrical condenser. Image aberrations are computed for the relativistic case for an axially symmetrical lens and a cylindrical lens. *J. E. Rosenthal.*

①

Strashkevich, A.M.

Card 1/1 Pub 90-7/9

Author : Strashkevich, A. M. and Reyzlin, A. S.

Title : Electron-optical action of grid systems

Periodical : Radiotekhnika, 10, 66-71, Feb 55

Abstract : The electron-optical action of a triode, which greatly influences the calculation and design of cathode-ray tubes, is investigated in this article. Special attention is given to the investigation of flat-electrode grid system, because of the recent tendencies toward the use of flat-electrode tubes, which have numerous advantages over the cylindrical type, particularly in the uniformity of electron field. The formula commonly used for estimating the potential gradient in the flat-electrode triode has been further refined. Relation of focus location to the electrical and geometrical parameters of the system is investigated.

Institution: - -

Submitted : April 16, 1954

SOV/58-59-7-15861

Translation from: Referativnyy Zhurnal Fizika, 1959, Nr 7, p 174 (USSR)

AUTHOR: Strashkevich, A.M.

TITLE: Cylindrical Electrostatic Lens Fields

PERIODICAL: Nauk. zap. Chernivets'k. un-t, 1955, Vol 12, pp 189 - 197 (Ukr.; Russ. résumé)

ABSTRACT: The author discusses fields of electrostatic slit lenses with plane and cylindrical electrodes. From his formulae for systems with an elliptical aperture (Zh. tekhn. fiz., 1952, Vol 22, 487), the author derives formulae for a slit system with plane electrodes. A comparison shows that these formulae are more accurate than the generally adopted approximate formulae (especially as regards the operating region of the lens). The author provides a convenient and practical means of plotting equipotential surfaces. He studies singular points and lines. He compares the magnitudes of deflecting forces calculated according to the accurate formula and various approximate formulae. The bibliography contains 14 titles. (Chernivets. Derzhav Univ., Chernovtsy, UkrSSR). S.

Card 1/1

STRASHKEVICH, A M

H

USSR / Electronics

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No9775

Author : Strashkevich, A.M.
Inst : Kiev Polytechnic Institute, Kiev
Title : New Physical-Engineering Methods for Simulation and Calculation of The Trajectories of Relativistic Charged Particles in Electrostatic Fields.

Orig Pub : Dokl. AN SSSR, 1956, 108, No 3, 440-443

Abstract : The method proposed for the determination of the trajectories of relativistic charged particles in an electrostatic field is based on that proposed in 1929 by **S.A. Boguslavskiy**, whereby the real field is replaced by a certain equivalent field in that sense, that in the equivalent field the nonrelativistic particle **moves along a trajectory** similar to the trajectory of the relativistic particle in a real field. A formula is given for recalculating the real potential into the

Card : 1/3

H

USSR / Electronics

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9775

Abstract : equivalent one. It is shown that with such a replacement of the fields the usual grapho-analytic methods for plotting the trajectories of the non-relativistic particles are applicable directly or with slight changes for the plotting of the trajectory of a relativistic particle. However, the method of the rubber membrane makes it possible in this case to find the trajectory, but does not determine the variation of the velocity of the particle along the trajectory. There are also literature references to automatic and semi-automatic methods for plotting the trajectories of non-relativistic particles, but they are not suitable in this case. It is indicated that it is possible to construct by grapho-analytical means a three-dimensional trajectory of a charged particle, and formulas are given for calculating the necessary corrections to the method of plotting a planar trajectory of a relativistic particle.

Card : 2/3

21-5-5/26

AUTHORS: Strashkevich, A.M. (Strashkovych, O.M.) and Miroshnichenko, Yu.D. (Miroshnychenko, Yu.D.)

TITLE: Investigation of the Electron-Optic Action of Certain Electrostatic Fields Without Axial Symmetry (Issledovaniye elektronnoopticheskogo deystviya nekotorykh elektrostaticheskikh poley bez osevoy simmetrii)

PERIODICAL: Dopovidi Akademii Nauk Ukrains'koi RSR, 1957, Nr 5, pp. 444-447 (USSR)

ABSTRACT: An electron-optic system without axial symmetry, an electrostatic cylindrical immersion lens, was investigated in relativistic approximation. The numerical methods of Cowell and Numerow-Fox were applied for the determination of trajectories of relativistic particles. The trajectories, represented by the curves in the figure in the article, show the general dispersive action of the investigated system for the entire relativistic range of variation in mass-values of the particles. The article contains 1 figure and 7 references, of which 5 are Slavic.

ASSOCIATION: Kiyev Polytechnic Institute (Kyivs'kyy politekhnichnyy instytut)
PRESENTED: By V.Ye. Lashkarev (Lashkar'ov), Academician of the AN Ukrainian SSR
SUBMITTED: 25 January 1957
AVAILABLE: Library of Congress
Card 1/1

21-1-1/26

AUTHOR: Strashkevich, A.M. (Ukrainian spelling: O.M.)

TITLE: Effect of a Space Charge on the Electron-Optic Properties of an Electrostatic System With One or Two Planes of Symmetry (Vliyaniye prostranstvennogo zaryada na elektronnoopticheskiye svoystva elektrostaticheskikh sistem s odnoy ili dvumya ploskostyami simmetrii)

PERIODICAL: Dopovidi Akademii Nauk Ukrains'koi RSR, 1958, # 1, pp 3-6 (USSR)

ABSTRACT: To take into account the effect of a space charge in electron-optic systems is one of the most difficult problems of electron optics. Up until recently, the main attention was paid to systems with axial symmetry. However, as non-axial-symmetric systems play a significant role in modern electronics, it is necessary to find out an effect of the space charge on their electron-optic properties. In the present article, the author derives general formulas of potential for electrostatic fields with one and two planes of symmetry taking into account the presence of a space charge. These formulas characterize the basic electron-optic properties of

Card 1/4

21-1-1/26

Effect of a Space Charge on the Electron-Optic Properties of an Electrostatic System With One or Two Planes of Symmetry

the above-mentioned fields.

As a first case, the author analyzes a cylindrical lens, that is a plane electrostatic field (the potential Φ must depend on y-coordinate) in which the yz-plane it its symmetry plane. Starting from the Poisson equation the author derives equations for the trajectory of a relativistic charged particle in the central section of a cylindrical lens. The integration of the second equation yields the following result [Ref. 7]:

$$y = C_1 \int \frac{dz}{\sqrt{a^2-1}} + C_2$$

Then the author generalizes the preceding result to the case of a space field in which the yz-plane is also a symmetry plane, and derives more generalized equations of the trajectory.

The last case considered is that of two symmetry planes, xz and yz. The the equation for potential in cylindrical coordinates will look as follows:

Card 2/4

21-1-1/26

Effect of a Space Charge on the Electron-Optic Properties of an Electrostatic System With One or Two Planes of Symmetry

$$\phi = \phi_z + r^2 \left[V''(z) + W(z) \cos 2\vartheta \right]$$

where:

$$V''(z) = -\frac{1}{4}\left[\phi_z'' + 4\pi\rho_{00}(z)\right]$$

Analyzing this equation the author shows that it contains the formula for cylindrical lenses and others as particular cases.

The article includes 5 Russian, 1 Ukrainian and 1 English reference.

ASSOCIATION: Kiyev Polytechnic Institute (**Kyivs'kyy politekhnichnyy instytut**)

Card 3/4

21-1-1/26

Effect of a Space Charge on the Electron-Optic Properties of an Electrostatic System With One or Two Planes of Symmetry

PRESENTED:	By Academician of the Ukrainian Academy of Sciences V.Ye. Lashkarev(V. Ye. Lashkar'ov)
SUBMITTED:	20 March 1957
AVAILABLE:	Library of Congress
Card 4/4	1. Space charges 2. Lenses-Analysis 3. Mathematics

SOV/109-3-7-15/25

AUTHOR: Strashkevich, A. M.

TITLE: Graphical-Analytical Construction of the Spatial Trajector-
ies of Relativistic Charged Particles in Electrostatic Fields
(Grafoanaliticheskoye postroyeniye prostranstvennykh
trayektoriy relyativistskikh zaryazhennykh chastits v
elektrostaticheskikh polyakh)

PERIODICAL: Radiotekhnika i elektronika, 1958, Vol 3, Nr 7,
pp 959-962 (USSR)

ABSTRACT: First the known "trigonometric" method is analysed and it is shown that it can be used for constructing the trajectories of relativistic particles. The basic equation of this method for a 2-dimensional relativistic trajectory (see Ref.2) is also valid for the case of spatial trajectories. If the angle of incidence of a corpuscular ray onto an equipotential surface is γ and the potential of the surface is Φ, the increase in the angle at a surface having a potential $\Phi + \Delta\Phi$ is given by Eq.(1), where $\kappa = -m_0c^2/e\Phi$ and the remaining symbols are as defined above. By means of Eq.(1) it is possible to construct the projections of the trajectory onto an arbitrary plane, e.g., the xy plane. The trajectories can also be constructed as follows: it is assumed that the vector impulse of the system has in-

Card 1/2

SOV/105-3-7-15/23

Graphical-Analytical Construction of the Spatial Trajectories of Relativistic Charged Particles in Electrostatic Fields

crements as defined by Eqs.(8), where $\Delta\Phi_x$, $\Delta\Phi_y$, $\Delta\Phi_z$ are the changes of potential for a displacement from a given point to a point differing by distances Δx, Δy and Δz. The method is known as the impulse-component-increment method and it appears to be simpler than the trigonometric method. The paper contains 6 references, 4 of which are Soviet, 1 English and 1 French.

ASSOCIATION: Kiyevskiy politekhnicheskiy institut (Kiyev Polytechnical Institute)

SUBMITTED: March 7, 1957.

1. Particles (Airborne)--Electrical properties 2. Electrostatic generation 3. Particles trajectories--Mathematical analysis

Card 2/2

[illegible]

AUTHOR: Strashkevich, A.M.

TITLE: Electron-Optic Properties of a Quadripole Electrostatic Lens (in Relativistic Approximation) [Elektronno-opticheskiye svoystva kvadrupol'noy elektrostaticheskoy linzy (v relativistskom priblizhenii)]

PERIODICAL: Dopovidi Akademii nauk Ukrains'koi RSR, 1959, Nr 9, pp 929 - 932 (USSR)

ABSTRACT: Quadripole lenses are used in accelerators of the "strong focusing" system and in the stigmatizers of electron-optic devices. However, as yet their theory has not been sufficiently developed, in particular for relativistic velocities of the particles. The author derives equations for trajectories of relativistic charged particles for fields with two planes of symmetry and two planes of antisymmetry, which can be conveniently integrated by the method of successive approximations. Formulae for the focal lengths and co-ordinates of the main points have been derived. The values of coefficients necessary for calculations are cited for a number of lenses. It is shown how these coefficients can be experimentally found for any quadripole system. A comparison

Card 1/2

SOV-21-59-9-4/28

Electron-Optic Properties of a Quadripole Electrostatic Lens.
in Relativistic Approximation

is made with the results obtained by other authors for special cases and in non-relativistic approximation. There are 2 graphs and 6 references, 3 of which are Soviet, 2 American and 1 French.

ASSOCIATION: Kiyevskiy politekhnicheskiy institut (Kiyev Polytechnic Institute)

PRESENTED: By Member of the AS UkrSSR, V.Ye. Lashkarev

SUBMITTED: April 18, 1959

NOTE: Russian title and Russian names of individuals and institutions appearing in this article have been used in the transliteration.

1. Lenses--Properties 2. Lenses--Mathematical analysis
3. Electron optics

Card 2/2

SOV/3007

PHASE I BOOK EXPLOITATION

9)

Strashkevich, Aleksey Mikhaylovich

Elektronnaya optika elektrostaticheskikh poley ne obladayushchikh osevoy simmetriyey (Electron Optics of Electrostatic Fields Without Axial Symmetry) Moscow, Fizmatgiz, 1959. 251 p. 6,000 copies printed. Ed.: V. Ya. Dubnova; Tech. Ed.: S. S. Gavrilov.

PURPOSE: This book is intended for electronic and radio physicists and engineers working in the field of vacuum-tube electronics, and for aspirants and senior students at schools of higher education studying electron optics.

COVERAGE: The author discusses the theory of electron optics of electrostatic fields with various types of symmetry and antisymmetry. He describes the operation of correctors, stigmatizers and "strong-focusing" systems using fields with a number of antisymmetrical and symmetrical planes. No personalities are mentioned. There are 148 references: 87 Soviet (including 9 translations), 27 English, 27 German and 7 French.

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SOV/48-23-6-9/28

AUTHOR: Strashkevich, A. M.

TITLE: Electron-optical Properties of Electrostatic Quadrupole Lenses (Elektronnoopticheskiye svoystva kvadrupol'nykh elektrostaticheskikh linz)

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959, Vol 23, Nr 6, pp 706 - 710 (USSR)

ABSTRACT: In the introduction to the present paper brief reference is made to the use of quadrupole lenses as stigmatizers in electron-optical systems and for the purpose of focusing in linear, cyclic, and other accelerators; it is pointed out that the theory, especially if relativistic velocities of particles occur, is unsatisfactory. In the present case, the relativistic relations are deduced. For the central range of the potential formula (1) is given, and from this relation the trajectories of the charged particles are deduced for the double-symmetric field of a stigmatizer in consideration of the relativistic velocities. From the latter the focal distances f_x and f_y are then obtained by projection into the xz- and yz-plane respecti-

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Electron-optical Properties of Electrostatic Quadrupole Lenses SOV/48-23-6-9/28

vely, which characterize the electron-optical properties. Next, the nonrelativistic formulas of quadrupole lenses with electrodes are developed in form of hyperbolic- and circular cylinders, and in the last part, the spatial field of a system of quadrupole lenses is investigated (Fig 4). For this system the x-component of the coefficient C is deduced from formula (1). For a similar system with electrodes of arbitrary shape it is recommended to obtain C_x by means of experiments. There are 5 figures and 9 references, 4 of which are Soviet.

ASSOCIATION: Kafedra fiziki Kiyevskogo politekhnicheskogo instituta (Chair of Physics, Kiyev Polytechnic Institute)

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E140/E163

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AUTHOR: Strashkevich, A.M.

TITLE: Catenary Method for Plotting the Trajectories of Relativistic and Ultra-Relativistic Particles in Electrostatic Fields

PERIODICAL: Radiotekhnika i elektronika, Vol 5, No 7, 1960, pp 1118-1123 (USSR)

ABSTRACT: The method presented here is analogous to that of Zworykin and Morton (Ref 1) where a method of parabolae is given for the graphical-analytic plotting of plane trajectories of non-relativistic particles. For relativistic particles the trajectory element differs little from a catenary since the field element differs little from homogeneous. In the limiting cases of ultra-relativistic particles and non-relativistic particles the trajectories depend only on the ratio of potentials applied to the electrodes to the accelerating potential and are independent of the specific charge. Thus, limiting trajectories are obtained between which the actual relativistic trajectory must fall. Trajectories calculated by the method described in the article and an exactly calculated trajectory are given in Fig 3, showing that

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the error is fairly small.
There are 3 figures and 2 Soviet references.

SUBMITTED: August 27, 1959

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26.2322

S/109/60/005/012/016/035
E192/E382

AUTHOR: Strashkevich, A.M.

TITLE: Three-dimensional Quadrupole Electrostatic Lenses

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol. 5, No. 12, pp. 1997 - 2005

TEXT: The theoretical calculations are normally carried out only for two-dimensional quadrupole lenses. However, in practice, the investigation of a three-dimensional system in which the potential is a function of all three rectangular coordinates is of considerable interest. Such lenses formed from small spherical electrodes were considered by the author in earlier works (Refs. 2, 3, 4) but only the simple case with two antisymmetry planes was investigated. It is desirable to extend the above theory to a more general case, when the antisymmetry of the three-dimensional field is absent. The system considered is shown in Fig. 1. If this system is not antisymmetrical ($b_1 = b_2 = b$), the electron-optical parameters for the central region of the field can be obtained on the

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basis of the approximate formulae obtained in an earlier paper (Ref. 5). These are in the form:

$$\Phi = \Phi_z + (x^2 + y^2)V(z) + (x^2 - y^2)W(z), \tag{3}$$

$$\Phi_z = \Phi_0 + 2Ub\left[(a_1^2 + z^2)^{-\frac{1}{2}} - (a_2^2 + z^2)^{-\frac{1}{2}}\right], \tag{3а}$$

$$V(z) = -\frac{1}{4}\Phi_z'' = -\frac{1}{2}Ub\left\{-(a_1^2 + z^2)^{-\frac{3}{2}} + (a_2^2 + z^2)^{-\frac{3}{2}} + 3z^2\left[(a_1^2 + z^2)^{-\frac{5}{2}} - (a_2^2 + z^2)^{-\frac{5}{2}}\right]\right\}, \tag{3б}$$

$$W(z) = \frac{3}{2}Ub\left[a_1^2(a_1^2 + z^2)^{-\frac{5}{2}} + a_2^2(a_2^2 + z^2)^{-\frac{5}{2}}\right]. \tag{3в}$$

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In Eq. (3a) Φ_0 denotes the accelerating potential; it is assumed that $b \ll a_1$ and $b \ll a_2$. On the basis of these equations it is possible to derive formulae for the optical powers $1/f_x$ and $1/f_y$ for the central region of the field. In a more general case, when $b_1 \neq b_2$, the potential U on the electrodes is replaced by U_1 and -U is replaced by U_2. The functions Φ_z, V and W are then given by:

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$$\Phi_z = \Phi_0 + 2\left[U_1 b_1 (a_1^2 + z^2)^{-\frac{1}{2}} + U_2 b_2 (a_2^2 + z^2)^{-\frac{1}{2}}\right]; \qquad (7а)$$

$$V(z) = -\frac{1}{4}\Phi_z'' = U_1 b_1 (a_1^2 + z^2)^{-\frac{5}{2}}\left(\frac{a_1^2}{2} - z^2\right) + U_2 b_2 (a_2^2 + z^2)^{-\frac{5}{2}}\left(\frac{a_2^2}{2} - z^2\right). \qquad (7б)$$

$$W(z) = \frac{3}{2}\left[U_1 b_1 a_1^2 (a_1^2 + z^2)^{-\frac{5}{2}} - U_2 b_2 a_2^2 (a_2^2 + z^2)^{-\frac{5}{2}}\right]. \qquad (7в)$$

The formulae for the optical powers are now

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$$\frac{1}{f_x} = -\frac{2lA_c}{\Phi_c}\left[\frac{U_1b_1(2a_1^2+l^2)}{a_1^2(a_1^2+l^2)^{\frac{3}{2}}} - \frac{U_2b_2}{a_2^2\sqrt{a_2^2+l^2}}\right], \qquad (8)$$

$$\frac{1}{f_y} = -\frac{2lA_c}{\Phi_c}\left[\frac{U_2b_2(2a_2^2+l_2^2)}{a_2^2(a_2^2+l^2)^{\frac{3}{2}}} - \frac{U_1b_1}{a_1^2\sqrt{a_1^2+l^2}}\right], \qquad (8a)$$

where Φ_c is given by:

$$\Phi_c = \Phi_0 + 2\left(\frac{U_1b_1}{a_1} + \frac{U_2b_2}{a_2}\right) \qquad (6b).$$

From Eqs. (8) it is seen that for $l \to \infty$, $1/f_x = -1/f_y$. The above formulae are valid for the systems which are symmetrical with respect to plane $z = const.$ However, the quadrupole lenses are normally used under such conditions

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Three-dimensional Quadrupole Electrostatic Lenses

that the field does not possess that type of symmetry. It is therefore of interest to consider the field of a lens which is situated in the vicinity of an equipotential plane. Such a plane can be, in practice, formed by a cathode, a screen or a diaphragm. This general case is analysed in some detail and approximate formulae for Φ_z, V and W are derived. The resulting expressions are then employed to derive the equations for the optical powers of the system.
There are 3 figures and 5 references: 3 Soviet and 2 non-Soviet.

SUBMITTED: January 11, 1960

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3140 (also 1140, 1141

AUTHOR: Strashkevych, O.M.

TITLE: Electrostatic quadrupole lenses, whose fields have no surfaces of antisymmetry

PERIODICAL: Akademiya nauk Ukrayins'koyi RSR. Dopovidi, no. 12, 1960, 1593-1597

TEXT: The author considers the potential field of the most general type of quadrupole lenses, i.e. those whose fields have 2 surfaces of symmetry and no surfaces of antisymmetry, and also the motion of relativistic charged particles in such a potential field. Quadrupole lenses of this type are represented by Figs. 1 and 2 provided that $a_1 \neq a_2$ and $\varphi_0 \neq \frac{\pi}{4}$. Investigation of the non-antisymmetric case makes clear the possibility of varying the influence of the quadrupole lens on a cluster of charged particles, and also reveals the nature and magnitude of the deviation of the electro-optical parameters of the system for

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Electrostatic quadrupole ...

certain deviations of over-all size of the set-up from the theoretical value. The length of the electrodes in the z-direction (perpendicular to the plane of the sketch) is taken to be sufficiently great so that the field may be considered as a two-dimensional, non-vanishing dependence on the potential from z. Applying a conformal transformation such that the real axis t_1 lies on the contour of cross-section of the electrodes, and applying the Christoffel-Schwartz formula gives in Fig. 1,

$$x + iy = -\frac{ia_2(t^2 + k)}{\sqrt{(t^2 + 1)(t^2 - k^2)}} \tag{1}$$

where

$$k = 1 + 2\frac{a_2}{a_1}\left[\frac{a_2}{a_1} - \sqrt{\left(\frac{a_2}{a_1}\right)^2 + 1}\right]; \quad \frac{a_2}{a_1} = \frac{1 - k}{2\sqrt{k}} \tag{2}$$

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Electrostatic quadrupole ...

The upper t-half-plane is mapped into the unit circle by the transformation

$$+ i = \frac{k + it}{k - it} \tag{3}$$

For the system of Fig. 2, the series

$$\Phi(r_0, \theta) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos n\theta. \tag{4}$$

and

$$\Phi(r, \theta) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \left(\frac{r}{r_0}\right)^n \cos n\theta. \tag{6}$$

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Electrostatic quadrupole ...

r r r_0, where $\frac{a_0}{2} = u_1 + \frac{2\ _0}{\ }(u_2 - u_1)$, $a_n = 0$ for n odd

$\frac{4 \sin n\ _0}{n}(u_2-u_1)$

for n even, and $_0 = \mathrm{arctg}\,\frac{2k}{1-k}$.

In the central region of the field it is sufficient to consider the motion of a particle in the planes of symmetry. The trajectories of a relativistic particle in this central region then found to be, in the case of Fig. 1,

$$\frac{\ }{x} = -2Cx, \quad \frac{\ }{y} = 2Cy \qquad (1$$

and in the case of Fig. 2,

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$$\frac{\partial \Phi}{\partial \xi} = -2C\xi, \quad \frac{\partial \Phi}{\partial \eta} = 2C\eta$$
$$C = \frac{2(u_2 - u_1)\sin 2\vartheta_0}{\pi r_0^2} \qquad (12)$$

where Φ is the potential. The expression for the focal lengths for the projection of the trajectory onto the planes of symmetry is, (ignoring the boundary effect)

$$\frac{1}{f_{x(\xi)}} = -\frac{1}{f_{y(\eta)}} = -\frac{ACL}{\Phi_0} \qquad (13)$$

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Electrostatic quadrupole ...

/Abstractor's note: Symbols not explained/. As also in the case of an antisymmetric quadrupole lens, the focal lengths differ only in sign. Formulae are derived to give an estimate of the deviation of the focal lengths from the corresponding value for an antisymmetric quadrupole lens. If ϕ_0 is the potential on the z-axis, then for $|\phi_0| \ll |a_2 - a_1|$ for Fig. 1 the formula is $f_{nonant} = f_{ant}\left(1 + \frac{\Delta}{4}\right)$ where f_{ant} is the focal length of the antisymmetric system for which $a_1 = a_2 = a$; f_{nonant} is the focal length of the system for which $a_1 = a$, $a_2 = a + \Delta$ (or $a_2 = a$, $a_1 = a + \Delta$). For Fig. 2, with deviation δ_0 from $\frac{\pi}{4}$, $f_{nonant} = f_{ant}$ [illegible] $\sin 2\delta_0$. There are 2 figures and 6 references: 3 Soviet-bloc and 3 non-Soviet-bloc. The references to the English-language publications read as follows: E.D. Courant, M.S. Livingston, H.S. Snyder, Phys. Rev. 88, 1190 (1952); G.D Archard,

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Electrostatic quadrupole ...

Proc. Phys. Soc., 68, 156. 817, (1955).

ASSOCIATION: Kyyivs'kyy polytekhnichnyy instytut (Kiyev Polytechnic Institute)

PRESENTED: by Academician AS UkrSSR, V.Ye. Lashkar'ov

SUBMITTED: February 9, 1960

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AUTHOR: Strashkevich, A. M.

TITLE: Quadrupole Lenses With Fields Without Antisymmetry

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PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1960, Vol. 30, No. 10, pp. 1199 - 1206

TEXT: Systems consisting of four electrodes are called electric quadrupole lenses and are used for "strong focusing" (Ref.1) in electron optics (Ref. 2) as well as for the correction of spherical and chromatic aberrations (Ref.3). The author discusses two types of systems here: such with electrodes in the form of plates (Fig.1) and such in the form of cylinder segments (Fig.2). The author studied potential fields without the antisymmetry of the quadrupole lenses shown in Figs. 1 and 2. Equations are derived in relativistic approximation for the flight paths of charged particles in the respective fields. Electron-optical parameters of the central regions are described by equations (17), (15a), and (16a) for the systems investigated (neglecting the boundary effect).

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STRASHKEVICH, A.M.

Simulation and calculation of the trajectories of relativistic charged particles in electrostatic fields. Radiotekh. i elektron 6 no.8:1401-1402 Ag '61. (MIRA 14:7)

(Particles (Nuclear physics)) (Trajectories)
(Electric fields)

STRASHKEVICH, A.M.

Investigation of nongaussian trajectories in the field of an electrostatic quadrupole lense. Radiotekh. i elektron. 6 no.9:1562-1565 S '61. (MIRA 14:8)

(Trajectories)
(Electron optics)

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AUTHOR: Strashkevich, A.M.

TITLE: An electrostatic quadrupole lens, whose field has two antisymmetric and no symmetric planes

PERIODICAL: Radiotekhnika i elektronika, v. 6, no. 10, 1961, 1725 - 1728

TEXT: The author analyzes the electron optical properties of a quadrupole lens with two antisymmetric and with no symmetric planes. Such a lens must have its azimuth symmetry planes of each pair of electrodes not at right angles with respect to each other but at an angle differing by 2γ (Fig. 1). The field then has symmetry planes, and two mutually perpendicular antisymmetric planes xz and yz. For both $2\gamma = \pi/2$ or any other γ, in each of the azimuth planes the potential of points, symmetrical with respect to z, is constant in magnitude and has the same sign. Denoting the constant value of potential at the z-axis by I_0, the potential of the field at any point can be represented by the expressions

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$$\Phi(x, y, z) = \Phi_0 + f_{11}(z)xy + f_{13}(z)xy^3 + f_{31}(z)x^3y + \dots \quad (1)$$

Going over to new coordinates ξ, η, z

$$x = \frac{\sqrt{2}}{2}(\xi - \eta), \qquad y = \frac{\sqrt{2}}{2}(\xi + \eta) \quad (2)$$

and

$$\xi = \frac{\sqrt{2}}{2}(x + y), \qquad \eta = \frac{\sqrt{2}}{2}(-x + y), \quad (2a)$$

Eq. (1) becomes

$$\Phi(\xi, \eta, z) = \Phi_0 + \frac{1}{2} f_{11}(z)(\xi^2 - \eta^2) + \frac{1}{4}[f_{13}(z) + f_{31}(z)](\xi^4 - \eta^4) + \frac{1}{2}[f_{13}(z) - f_{31}(z)](\xi^3\eta - \xi\eta^3) + \cdots \quad (3)$$

It may be seen from this expression that near the z-axis, the ξz and ηz planes are planes of symmetry, and also that from considerable distances from the axis this symmetry disappears provided the coefficients f_{13} and f_{31} are not identical. If, therefore, for any

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An electrostatic quadrupole ...

reason the angle γ deviates from the value π/4, the electron optical characteristics of the central region of the system field do not qualitatively change. The quantitative changes which take place are illustrated by considering the example of a system of four spherical electrodes of a small radius (Fig. 1). If the spheres are of negligible radii and have charges ± q, the potential at point x, y, z is given by

$$\begin{aligned}\Phi = \Phi_0 + q\,\{[(x - x_1)^2 + (y - y_1)^2 + z^2]^{-\frac{1}{2}} + \\ + [(x + x_1)^2 + (y + y_1)^2 + z^2]^{-\frac{1}{2}} - [(x - x_1)^2 + (y + y_1)^2 + z^2]^{-\frac{1}{2}} - \\ - [(x + x_1)^2 + (y - y_1)^2 + z^2]^{-\frac{1}{2}}\}.\end{aligned} \qquad (4)$$

By resolving Eq. (4) into the McLaurin series and comparing with Eq. (1),

$$f_{11}(z) = \left(\frac{\partial^2\Phi}{\partial x\,\partial y}\right)_{00} = 12qx_1y_1(x_1^2 + y_1^2 + z^2)^{-\frac{5}{2}} = 6qa^2\sin 2\gamma\,(a^2 + z^2)^{-\frac{5}{2}}, \qquad (5)$$

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$$f_{13}(z) = \frac{1}{6}\left(\frac{\partial^4\Phi}{\partial x \partial y^3}\right)_{00} = 5qa^2 \sin 2\gamma \, (a^2 + z^2)^{-\frac{9}{2}} [a^2 (7 \sin^2 \gamma - 3) - 3z^2], \qquad (5a)$$

(5a)

and

$$f_{31}(z) = \frac{1}{6}\left(\frac{\partial^4\Phi}{\partial x^3 \partial y}\right)_{00} = 5qa^2 \sin 2\gamma \, (a^2 + z^2)^{-\frac{9}{2}} [a^2 (7 \cos^2 \gamma - 3) - 3z^2], \qquad (5b)$$

are obtained. The trajectory equations of a relativistic-charged particle Eqs. (1, 2a) for the central region may be written as

$$x'' = k(z)y, \quad y'' = k(z)x \qquad (6)$$

with x" and y" being derivatives with respect to z and the variable coefficient k(z) having the value

$$k(z) = \frac{1 - \frac{e\Phi_0}{m_0c^2}}{1 - \frac{e\Phi_0}{2m_0c^2}} \frac{f_{11}(z)}{2\Phi_0} = A\frac{f_{11}(z)}{2\Phi_0}. \qquad (6a)$$

In it e is the algebraic value of the charge; m_0 - the mass of the

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particle at rest; c - velocity of light in vacuo. Eqs. (6) may be integrated by the method of consecutive approximations. It is stated in conclusion that the central region of a two-way antisymmetric field has two symmetric plans, even if in its wider region there are no symmetric planes with the angle 2γ varying arbitrarily. The coordinates of main points remain constant and optical forces vary in proportion to sin 2γ

$$C_z = \frac{1}{2} f_{11}(z) = 3a^2bU \sin 2\gamma(a^2 + z^2)^{-\frac{5}{2}}. \qquad (10)$$

There are 2 figures and 4 references: 3 Soviet-bloc and 1 non-Soviet-bloc. The reference to the English-language publication reads as follows: G.D. Archard, Proc. Phys. Soc. B, 1955, 68, 11, 817.

SUBMITTED: January 28, 1961

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AUTHOR: Strashkevich, A. M.

TITLE: Basic electron-optical properties of transaxial electrostatic systems

PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 32, no. 9, 1962, 1142 - 1152

TEXT: This paper deals with transaxial systems having axisymmetric fields which control the motion of charged particles flying almost perpendicularly to the axis of symmetry of the field. The relations derived are illustrated by comparatively simple examples of fields which have adequate symmetry characteristics. Results obtained are of special interest for practical applications, since it is possible to obtain via transaxial systems the so-called disk beam being used in electron contact tubes (Ye. V. Bykhovskaya, A. M. Kharchenko, M. I. Yelinson, D. V. Zernov: Radiotekhnika i elektronika, 5, No. 5, 849, 1960). Disk beam contact tubes are said to be superior as to their powerful beam, great operational stability and small closed contact resistance. General electron-optical properties of transaxial field systems are claimed to have been investigated in this study for the first time. The following relations between the functions
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Basic electron-optical properties...

φ_i were obtained from the potential $\Phi(r,z) = \varphi_0(r) + \varphi_2(r)z^2 + \varphi_4(r)z^4 + \ldots$ (2), in which the function $\varphi_0(r)$ gives the potential distribution in the plane of symmetry of the field and which is sufficient for investigating the entire field: For the region near the plane of symmetry of the potential $z = 0$: $\varphi_2(r) = -(1/2[\varphi_0''(r) + (1/r)\varphi_0'(r)]$ (3), and for a wider region: $\varphi_4(r) = (1/4!)[\varphi_0^{IV}(r) + (2/r)\varphi_0'''(r) - (1/r^2)\varphi_0''(r) + (1/r^3)\varphi_0'(r)]$ (4). If the action of the space charge is allowed for, these equations will take the form $\varphi_2 = -(1/2)(\varphi_0'' + (1/r)\varphi_0' + 4\pi\varrho_0$ (37) and $\varphi_4 = (1/4!)[\varphi_0^{IV} + (2/r)\varphi_0''' - (1/r^2)\varphi_0'' + (1/r^3)\varphi_0'] + (\pi/6)[(1/r)\varrho_0' + \varrho_0'' - 2\varrho_2]$ (38), respectively. An example of fields with such a symmetry is the known system made up of two parallel disks with equal potential and of two coaxial cylinders one of which has an annular slit (Fig. 2). Assuming this slit is narrow, the following equation was obtained for the internal region of such a system ($a \leqslant r \leqslant b$): $\Phi(r,z) = U(\ln\frac{r}{b}/\ln\frac{a}{b}) + pl\int_0 g(r,\lambda)\cos\lambda z\,[J_1(\lambda l)/\lambda]\,d\lambda$ (9). The equation for the external region ($r \geqq b$) reads:

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$$\Phi_1^-(r,\ z) = pl\int_0^\infty \frac{K_0(r\lambda)}{K_0(b\lambda)}\cos\lambda z\,\frac{J_1(\lambda l)}{\lambda}\,d\lambda, \qquad (10)$$

where

$$g(r,\lambda) = \frac{I_0(\lambda r)K_0(\lambda a) - I_0(\lambda a)K_0(\lambda r)}{I_0(\lambda b)K_0(\lambda a) - I_0(\lambda a)K_0(\lambda b)} \qquad (11a);$$

I_o and J_1 are Bessel functions, K_o is the MacDonald function. An investigation of equipotential lines in an azimuthal plane furnished the following equation for the curvature of such a line:

$$\frac{1}{R_s} = \frac{\begin{vmatrix} \varphi_0''(r_0) & 0 & \varphi_0'(r_0) \\ 0 & 2\varphi_2(r_0) & 0 \\ \varphi_0'(r_0) & 0 & 0 \end{vmatrix}}{\left([\varphi_0'(r_0)]^2 + 0\right)^{3/2}} = \frac{1}{r_0} + \frac{\varphi_0''(r_0)}{\varphi_0'(r_0)}. \qquad (14)$$

The electron-optical action of the respective part of the field is shown to be determined by the amount and sign of the curvature. For the optical power of the elementary layers, the equations

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Basic electron-optical properties...

$$\frac{1}{f_z} = \frac{1}{r} + \frac{\varphi_0''(r)}{\varphi_0'(r)} \frac{\varphi_0'(r)\Delta r}{2\varphi_0(r)} \quad (20) \text{ and } \quad \frac{1}{f_\theta} = -\frac{1}{r}\frac{\varphi_0'\Delta r}{2\varphi_0} \quad (20b)$$

were obtained in non-relativistic approximation, and

$$\frac{1}{f_r} = \frac{1 - \frac{e\varphi_0}{m_0c^2}}{1 - \frac{e\varphi_0}{2m_0c^2}} \left[\frac{1}{r} + \frac{\varphi_0''(r)}{\varphi_0'(r)}\right] \frac{\varphi_0'\Delta r}{2\varphi_0} \quad (20a) \text{ and } \quad \frac{1}{f_\theta} = -\frac{1 - \frac{e\varphi_0}{m_0c^2}}{1 - \frac{e\varphi_0}{2m_0c^2}} \frac{1}{r} \frac{\varphi_0'\Delta r}{2\varphi_0} \quad (20c)$$

in relativistic approximation. It is shown that if a singular point is present in the azimuthal plane the equipotential lines therein have an inclination which can be calculated from φ = arc cot $\{1 + [\varphi_0(r_0)/r_0\varphi_0''(r_0)]\}$ (...). If, however, the singular point does not lie on the axis of symmetry, then the equipotential lines will intersect at right angles and the totality of the singular points will form a singular circumference. Emphasis is laid on the calculation of the electron trajectories ..., especially the third equation of

$$\left.\begin{aligned} \ddot{r} - r\dot{\theta}^2 &= \frac{F_r}{m}, \\ 2\dot{r}\dot{\theta} + r\ddot{\theta} &= \frac{F_\theta}{m}, \\ \ddot{z} &= \frac{F_z}{m}. \end{aligned}\right\} \quad (26)$$

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S/057/62/032/009/014/014
B117/B186

Basic electron-optical properties...

since F_z stipulates the focusing and defocusing of the disk beam. The trajectories were investigated in non-relativistic approximation with and without allowance for the action of the space charge, as well as in relativistic approximation without allowance for this. The equations $z'' + (\varphi_0'/2\varphi_0)z' + [\varphi_0'' + (1/r)\varphi_0'/2\varphi_0]z = 0$ (29) and $y'' + (\varphi_0'/2\varphi_0)y' - (\varphi_0'/2x\varphi_0)y = 0$ (31) were derived for a trajectory running near one of the radii in the central plane of symmetry and at a small angle to that plane. Designations: z is the axis of symmetry; z = 0 is the plane of symmetry of the potential; m is the mass; $x = r\cos\vartheta$; $y = r\sin\vartheta$. There are 5 figures.

ASSOCIATION: Kiyevskiy politekhnicheskiy institut, Kafedra fiziki (Kiyev Polytechnic Institute, Department of Physics)

SUBMITTED: November 25, 1961

Card 5/6

Basic electron-optical properties...

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B117/B186

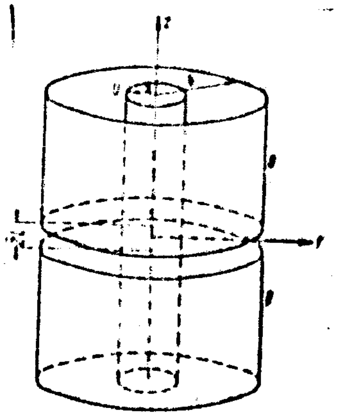

Fig. 2

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L 10169-63 EWT(1)/BDS/EEC(b)-2/ES(w)-2—
AFFTC/ASD/ESD-3/SSD—Pab-4—IJP(C)
ACCESSION NR: AP3000002 S/0057/63/033/005/0512/0517

64
63

AUTHOR: Strashkevich, A. M.

TITLE: Spherical aberration of electrostatic quadrupole lenses 21

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 33, no. 5, 1963, 512-517

TOPIC TAGS: spherical aberration, electrostatic lenses

ABSTRACT: It has been shown by Markovich, M. G. and Tsukkerman, I. I. (ZhTF, 30, 1362, 1960) that the spherical aberration of short magnetic lenses may change sign if the field does not have symmetry planes. Accordingly, it was deemed of interest to determine whether and under what conditions the spherical aberration of electrostatic lenses can change sign. Equations for the potential distribution and trajectories are adduced for quadrupole electrostatic lenses and the two extreme cases of a short and an infinitely long (two-dimensional) lens are analyzed. Systems with twofold symmetry and asymmetrical systems are considered. An equation showing under what hypothetical conditions the spherical aberration of an infinite two-dimensional lens can change sign is

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ACCESSION NR: AP3000002

given. It is concluded that the spherical aberration of a short quadrupole lens can change sign if the field is asymmetrical. The deduced relationships are illustrated in the specific cases of systems with small-radius spherical and cylindrical electrodes. Orig. art. has: 28 equations and 2 figures.

ASSOCIATION: Kiyevskiy ordena Lenina politekhnicheskiy institut (Kiev Polytechnical Institute)

SUBMITTED: 23Apr62 DATE ACQ: 12Jun63 ENCL: 00

SUB CODE: PH,SD NR REF SOV: 003 OTHER: 002

Card 2/2

ACCESSION NR: AP4042926 S/0057/64/034/008/1401/1408

AUTHOR: Strashkevich, A.M. (Member of physics department)

TITLE: Third order geometric aberrations of two dimensional quadrupole electrostatic lenses

SOURCE: Zhurnal tekhnicheskoy fiziki, v.34, no.8, 1964, 1401-1408

TOPIC TAGS: electron optics, electron lens, electrostatic focusing

ABSTRACT: The third order aberrations are calculated for a quadrupole electrostatic lens, the potential of which is symmetric with respect to each of the two planes xy = 0, antisymmetric with respect to each of the two planes $x^2 = y^2$, and is independent of z (x,y,z are rectangular Cartesian coordinates). The general expression to quadratic terms in the coordinates for the potential of such a lens contains only two constants, of which only one depends on the shape of the electrodes. The differential equations for the trajectories are written to cubic terms, and the constants are eliminated by a coordinate transformation. Subsequent calculations thus relate to all lenses of the type discussed. The coordinate transformation involved is simply a uniform dilatation. The trajectories are calculated in the Gaussian

ACCESSION NR: AP4042926

approximation, and these are discussed in detail. The system is convergent in one of the symmetry planes and has a sequence of equally spaced Gauss image planes for which the magnifications are unity in magnitude but alternate in sign. In the other symmetry plane the system is divergent, and there are no real images. The intersection of any plane normal to the axis with the bundle of rays which issues from a single object point and intersects the aperture plane in an axially centered circle is an ellipse, which reduces to a line segment for the Gaussian plane. The expressions for the Gaussian trajectories are substituted for the third degree terms in the trajectory equations, and the resulting equations are solved for the perturbed trajectories. Expressions are thus obtained for the 20 third order aberration coefficients in terms of trigonometric and hyperbolic functions of the aperture and image plane distances. These coefficients are assigned to the various aberrations to which they give rise: distortion, spherical aberration, coma, astigmatism, and field curvature. The different aberrations are discussed in some detail, particularly for the somewhat dimplified case in which the aperture plane is close to the object plane, and they are compared with the corresponding aberrations in axially symmetric systems, from which they naturally differ considerably. Orig.art.has: 56 formulas.

ACCESSION NR: AP4042926

ASSOCIATION: Kievskiy politekhnicheskiy institut, Kafedra Fiziki (Physics Department, Kiev Polytechnic Institute)

SUBMITTED: 04Nov63

ENCL: 00

SUB CODE: EM, NP

NR REF SOV: 003

OTHER: 002

L 33172-65 EWT(1) Pq-4 IJP(c) S/0057/65/035/002/0177/0183

ACCESSION NR: AP5005214

37 B

AUTHOR: Strashkovich, A.M.

TITLE: Focusing of broad beams in the fields of electrostatic cylindrical lenses and transaxial systems 21

SOURCE: Zhurnal tekhnicheskoy fiziki, v.35, no.2, 1965, 177-183

TOPIC TAGS: electron optics, cylindrical lens, aberration, mathematical physics

ABSTRACT: The third order aberrations of a cylindrical electrostatic lens are calculated, as well as those of a transaxial system. Particular attention is given to the relation between the two types of system, the possibility of removing spherical aberration from a cylindrical lens, and aberrational blurring in the direction parallel to the generators of the cylindrical equipotential surfaces. The calculations are based on nonrelativistic trajectory equations. The conclusion of M.Rheinfurth (Optik 12,411,1955) that the spherical aberration of a cylindrical lens cannot vanish is shown to be strictly valid only for the central portion of the image; the spherical aberration can vanish in the outer regions of the image that cannot be reached by the plane beams discussed by Rheinfurth. The formulas obtained for

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L 33172-65
ACCESSION NR: AP5005214

the aberrations of cylindrical lenses and transaxial systems contain terms that may be regarded as corrections for the finite beam width to analogous formulas derived by V.M.Strashkevich (ZhTF 32,1124,1962) and N.I.Shtepa (Radiotekhnika i elektronika 9,272,1964) for the case of a plane beam. It is shown that the aberrations of a transaxial system are asymptotic to those of a cylindrical lens at large distances from the axis. Orig.art.has: 60 formulas.

ASSOCIATION: Kafedra fiziki Kiyevskogo politekhnicheskogo instituta (Physics Department, Kiev Polytechnic Institute)

SUBMITTED: 30Mar64 ENCL: 00 SUB CODE: OP,EC

NR REF SOV: 007 OTHER: 003

Card 2/2

L [illegible] EWT(1) [illegible]-2/T/EWA(1) Pz-6/Po-4/Pu-4 WW
S/0057/65/035/002/0184/0185

ACCESSION NR: AP5005215

14
B

AUTHOR: Strashdevich, A.M.

TITLE: On the use of the effective potential method in relativistic electron optics

21

SOURCE: Zhurnal tekhnicheskoy fiziki, v.35, no.2, 1965, 184-185

TOPIC TAGS: electron optics, relativity theory, Laplace equation

ABSTRACT: The discrepancy between the relativistic paraxial trajectory equations for a transaxial lens derived, respectively, by A.M.Strashkevich (ZhTF 32,1142, 1962) and N.I.Shtepa (Radiotekhnika i elektronika 9,272,1964) is traced to an incorrect use of Boguslavskiy's equivalent potential method by the latter author. The error arose because, unlike the true potential, the equivalent potential is not a solution of Laplace's equation and may therefore be substituted for the true potential only before, and not after, simplifications based on Laplace's equation have been introduced. The sort of error that can be introduced by ignoring this fact is illustrated by a simple example. Orig.art.has: 5 formulas.

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L 33171-65
ACCESSION NR: AP5005215

ASSOCIATION: Kiyevskiy politekhnicheskiy institut, Kafedra fiziki (Physics Department, Kiev Polytechnic Institute)

SUB CODE: OP, NP

SUBMITTED: 27Apr64 ENCL: 00

NR REF SOV: 004 OTHER: 001

Card 2/2

L 39471-65 EWT(1)/EEC(b)-2/EWA(b) Pm-4/Pn-4/Pac-4/Peb/Pi-4/Pj-4 JM

S/0109/65/010/002/0341/0347 32 31 B

ACCESSION NR: AP5005349

AUTHOR: Strashkevich, A. M.

TITLE: Electrostatic systems with helical symmetry

SOURCE: Radiotekhnika i elektronika, v. 10, no. 2, 1965, 341-347

TOPIC TAGS: TW tube, 25 double helical electrode

ABSTRACT: The distribution of potential is theoretically investigated, and equations are set up for near-axis trajectories of charged particles in multiple-ribbon-helix electrodes as used in TW tubes. A two-ribbon helix is analyzed and the results compared with those obtained by P. K. Tien (J. Appl. Phys., 1954, 25, 10, 1281). Equations are also set up for a four-ribbon, two-pair (different-width), and eight-ribbon helical electrodes. The author's method is claimed to be universal and applicable to any number of ribbons in the electrode; it also permits, by considering more terms in expansions, evaluating far-from-the-axis

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L 39471-65
ACCESSION NR: AP5005349

trajectories. Orig. art. has: 5 figures and 35 formulas.

ASSOCIATION: Kafedra fiziki, Kiyevskiy politekhnicheskiy institut (Physics Department, Kiev Polytechnic Institute)

SUBMITTED: 04Nov63 ENCL: 00 SUB CODE: EC

NO REF SOV: 004 OTHER: 002

Card 2/2

[illegible]

[illegible] deflection of [illegible] be[illegible] [illegible] systems. [illegible]

1. [illegible] politekhnicheskiy institut, [illegible].

[illegible], A. A.

[illegible] properties of [illegible] grid [illegible].
[illegible] [illegible] [illegible] '65.

Chromatic aberrations of [illegible] electrostatic systems.
(MIRA 19:8)
[illegible]

1. Kafedra [illegible] instituta.

STRASHKEVICH, L.I.; VORONOV, B.V.

Exhibitions and displays of special items. Inform.biul.VDNKh no.11:35-36 N '64. (MIRA 18:2)

1. Glavnyy metodist pavil'ona "Biologiya" AN SSSR na Vystavke dostizheniy narodnogo khozyaystva SSSR (for Strashkevich). 2. Direktor pavil'ona "Professional'notekhnicheskoye obrazovaniye" na Vystavke dostizheniy narodnogo khozyaystva SSSR (for Voronov).

L 38100-65 EWT(1)/EPF(n)-2/EWG(m)/EPA(w)-2 Pz-6/Po-4/Pab-10/Pi-4 IJP(c) WW/AT

S/0185/65/010/002/0117/0122

44
41
B

ACCESSION NR: AP5005905

AUTHOR: Safronov, B. H. (Safronov, B. G.); Strashko, A. P.

TITLE: Simulation of the magnetic field of a Theta pinch 21

SOURCE: Ukrayins'kyy fizychnyy zhurnal, v. 10, no. 2, 1965, 117-122

TOPIC TAGS: Theta pinch, plasma pinch, magnetic field distribution

ABSTRACT: The authors state in the introduction that the elementary assumption that the magnetic fields of the induced currents in a θ-pinch is much smaller than the inducing magnetic field is not always correct, and if the external magnetic field is homogeneous the induced current in the θ-pinch is inhomogeneous and reverses sign near the turn. The authors therefore calculate the resultant field in a simple configuration wherein the pinch is represented by an annular conductor carrying a current and compare the results of the calculation with measurements of magnetic fields in a single-turn model of a pinch made in the form of a thin copper ring placed in a high-frequency field. The theoretical model of the pinch is represented by a single-turn bulky coil and a field induced in a short-circuited

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ACCESSION NR: AP5005905

3

ring placed in the center of the coil. The experimental test set-up is shown in Fig. 1 of the Enclosure. The tests were made at a frequency of 2×10^5 cps. The calculations show that the magnetic field is not uniform and may reverse sign near the coil. The experimental data are in good agreement with the calculations. Measurements of the magnetic field distribution were made on single turn coils of length 200, 50, and 25 mm, and the results of the measurements differed little from one another, within the accuracy of the original calculations. "The authors thank K. D. Sinel'nikov and N. A. Khizhnyak for valuable advice." Orig. art. has: 6 figures and 7 formulas.

ASSOCIATION: Kharkivs'kyy derzhuniversytet im. O. M. Gor'kogo (Khar'kov State University)

SUBMITTED: 15May64

ENCL: 01

SUB CODE: ME, EM

NR REF SOV: 003

OTHER: 000

Card 2/3

SAFRONOV, B.G. [Safronov, B.H.]; STRASHKO, A.P.

Θ-pinch model of a magnetic field. Ukr. fiz. zhur. 10 no.2:117-124 F '65. (MIRA 18:4)

1. Khar'kovskiy gosudarstvennyy universitet im. Gor'kogo.

STRASHKO, A.Ya

ASHURKOV, V. I.; STRASHKO, A. Ya.;

Cranes, Derricks, etc.

Diesel-electric railway crane SK-25 Mekh. trud. rab. no. 6, 1952.

Monthly List of Russian Accessions, Library of Congress, August 1952. Unclassified.

ASHURKOV, V.I., inzhener, laureat Stalinskoy premii; STRASHKO, A.Ya., inzhener,
laureat Stalinskoy premii; KHODOV, M.P., inzhener, laureat Stalinskoy
premii; PODLYASHCHUK, L.A., inzhener.

The SKG-25 diesel electric caterpillar crane. Mekh.trud.rab. 9 no.4:
24-26 Ap '55. (MIRA 8:7)
(Cranes, derricks, etc.)

STRASHKO, A.Ya., inzh.; KHODOV, M.P.

New SKG-50 assembling crane. Mont. i spets. rab. v stroi. 23 no. 2:7-11 F '61. (MIRA 14:1)

1. Glavstal'konstruktsiya i Proyektnyy institut Promstal'konstruktsiya.
(Cranes, Derricks, Etc.)

STRASHKO, L.Ye., inzh.; [illegible], inzh.; [illegible]

Erection of a metal, tower headframe in the Donets Basin. Shakht. stroi. 9 no.4:18-20 Ap '65. (MIRA 18:5)

1. Donetskiy Promstroyniiproyekt.